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(54) **DIAGNOSIS AND REPAIR FOR
AUTONOMOUS VEHICLES**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,924,984 A	8/1933	Fageol
3,186,508 A	6/1965	Lamont
3,324,805 A	6/1967	Mulch
3,596,728 A	8/1971	Neville

(Continued)

FOREIGN PATENT DOCUMENTS

EP	2216225 A1	8/2010
JP	09-160643 A	6/1997

(Continued)

OTHER PUBLICATIONS

International Search Report and the Written Opinion for Application
No. PCT/US 2011/054896, Apr. 25, 2012.

(Continued)

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(57) **ABSTRACT**

A system and method of controlling a vehicle is provided. In
one aspect, the system and method determines the amount of
wear on a component of the vehicle and, based on the amount
of wear and information derived from the environment sur-
rounding the vehicle (e.g., another vehicle in the path of the
vehicle or a requirement to stop at a particular location),
maneuvers the vehicle to mitigate further wear on the com-
ponent.

17 Claims, 6 Drawing Sheets

